What is claimed is:

CLAIMS

1.   An optical packet switching method for switching inputted optical
5   packets over NW wavelengths, the inputted optical packets comprising optical
packets having different attributes of at least one packet characteristic, where NW is
an integer greater than one, the method comprising:

grouping the NW wavelengths into KG groups of wavelengths
characterized in that each of the KG groups of wavelengths is allocated to optical
10   packets distinguished from other optical packets by at least one attribute of said at
least one packet characteristic, where KG is an integer greater than one; and

switching each one inputted optical packet over a wavelength having
an available transmission resource selected from among wavelengths in one of said
KG groups of wavelengths that is matched to the one inputted optical packet by
15   correspondence of attributes of said at least one packet characteristic.

2.   The method according to claim 1 and wherein said at least one packet
characteristic comprises a characteristic based on delay sensitivity.

20   3.   The method according to claim 1 and wherein said at least one packet
characteristic comprises a characteristic based on optical packet bit-rate range.

4.   The method according to claim 1 and wherein said at least one packet
characteristic comprises a characteristic based on optical packet carrier wavelength
25   band.

5.   The method according to claim 1 and wherein said at least one packet
characteristic comprises a characteristic based on optical packet carrier wavelength
separation from other wavelengths.

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6.　　　　The method according to claim 1 and wherein said at least one packet characteristic comprises a characteristic based on optical packet carrier wavelength priority.

7.　　　　The method according to claim 1 and wherein said at least one packet characteristic comprises a characteristic based on optical packet service level.

8.　　　　The method according to claim 1 and wherein said at least one packet characteristic comprises a characteristic based on a hierarchical combination of at least two of the following: delay sensitivity; optical packet bit-rate range; optical packet carrier wavelength band; optical packet carrier wavelength separation from other wavelengths; optical packet carrier wavelength priority; and optical packet service level.

9.　　　　The method according to claim 1 and wherein said transmission resource comprises at least one of the following: a queue of optical packets; a wavelength; a lightpath; and a polarization direction over a wavelength.

10.　　　　The method according to claim 1 and wherein said grouping comprises dynamically grouping the NW wavelengths into said KG groups of wavelengths based on changes in amounts of at least some of those of the inputted optical packets having said different attributes of said at least one packet characteristic.

11.　　　　The method according to claim 10 and wherein said grouping comprises determining said changes prior to said dynamically grouping, said determining being performed in at least one of the following: an optical network management system; and a switching/routing control unit of an optical packet switch.

12.   The method according to claim 10 and wherein said dynamically grouping comprises dynamically changing at least one of the following: group size of at least two of the KG groups; and KG.

5   13.   A wavelength allocation method for use in an optical packet switch to select from among NW wavelengths an output wavelength over which to output an optical packet, where NW is an integer greater than one, the method comprising:

grouping the NW wavelengths into KG groups of wavelengths characterized in that each of the KG groups of wavelengths is allocated to optical

10   packets distinguished from other optical packets by at least one attribute of at least one packet characteristic, where KG is an integer greater than one;

finding one of the KG groups of wavelengths that matches said optical packet by correspondence of attributes of said at least one packet characteristic; and

selecting, from among wavelengths in said one of the KG groups of

15   wavelengths, a wavelength having an available transmission resource as the output wavelength.

14.   The method according to claim 13 and wherein said at least one packet characteristic comprises one of the following:

20   a characteristic based on one of the following: delay sensitivity, optical packet bit-rate range, optical packet carrier wavelength band, optical packet carrier wavelength separation from other wavelengths, optical packet carrier wavelength priority, and optical packet service level; and

a characteristic based on a hierarchical combination of at least two of

25   the following: delay sensitivity, optical packet bit-rate range, optical packet carrier wavelength band, optical packet carrier wavelength separation from other wavelengths, optical packet carrier wavelength priority, and optical packet service level.

15.   The method according to claim 13 and wherein said transmission resource comprises at least one of the following: a queue of optical packets; a wavelength; a lightpath; and a polarization direction over a wavelength.

16.   An optical packet switch for switching inputted optical packets over NW wavelengths, the inputted optical packets comprising optical packets having different attributes of at least one packet characteristic, where NW is an integer greater than one, the optical packet switch comprising:

a switching fabric; and

a switching/routing control unit operatively associated with the switching fabric and operative to control the switching fabric for switching each one inputted optical packet over a wavelength having an available transmission resource selected from among wavelengths in one of KG groups of wavelengths, where KG is an integer greater than one, the KG groups of wavelengths are formed by grouping the NW wavelengths and are characterized in that each of the KG groups of wavelengths is allocated to optical packets distinguished from other optical packets by at least one attribute of said at least one packet characteristic, and said one of KG groups of wavelengths is matched to said one inputted optical packet by correspondence of attributes of said at least one packet characteristic.

17.   The optical packet switch according to claim 16 and wherein said switching/routing control unit is operative to determine said KG groups of wavelengths and to determine, for each said one inputted optical packet, the wavelength having the available transmission resource in said one of KG groups of wavelengths.

18.   The optical packet switch according to claim 16 and wherein said switching/routing control unit is operative to receive a determination of at least some of the KG groups of wavelengths from an optical network management system, and, based on said determination, to determine, for each said one inputted optical packet,

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the rest of the KG groups of wavelengths and the wavelength having the available transmission resource in said one of KG groups of wavelengths.

19.   The optical packet switch according to claim 16 and wherein said at least one packet characteristic comprises one of the following:

a characteristic based on one of the following: delay sensitivity, optical packet bit-rate range, optical packet carrier wavelength band, optical packet carrier wavelength separation from other wavelengths, optical packet carrier wavelength priority, and optical packet service level; and

a characteristic based on a hierarchical combination of at least two of the following: delay sensitivity, optical packet bit-rate range, optical packet carrier wavelength band, optical packet carrier wavelength separation from other wavelengths, optical packet carrier wavelength priority, and optical packet service level.

20.   The optical packet switch according to claim 16 and wherein said transmission resource comprises at least one of the following: a queue of optical packets; a wavelength; a lightpath; and a polarization direction over a wavelength.

21.   A wavelength allocation apparatus for use in an optical packet switch to select from among NW wavelengths an output wavelength over which to output an optical packet, where NW is an integer greater than one, the apparatus comprising:

a processing unit operative to group the NW wavelengths into KG groups of wavelengths characterized in that each of the KG groups of wavelengths is allocated to optical packets distinguished from other optical packets by at least one attribute of at least one packet characteristic, where KG is an integer greater than one; and

a switching/routing control unit operatively associated with the processing unit and operative to perform the following:

find one of the KG groups of wavelengths that matches said optical packet by correspondence of attributes of said at least one packet characteristic, and

select, from among wavelengths in said one of the KG groups of wavelengths, a wavelength having an available transmission resource as the output wavelength.

22.   The apparatus according to claim 21 and wherein said at least one packet characteristic comprises one of the following:

a characteristic based on one of the following: delay sensitivity, optical packet bit-rate range, optical packet carrier wavelength band, optical packet carrier wavelength separation from other wavelengths, optical packet carrier wavelength priority, and optical packet service level; and

a characteristic based on a hierarchical combination of at least two of the following: delay sensitivity, optical packet bit-rate range, optical packet carrier wavelength band, optical packet carrier wavelength separation from other wavelengths, optical packet carrier wavelength priority, and optical packet service level.